

# CS477/ECE478 - Formal Software Development Methods

## Homework 5 - Model checking imperative programs

April 24, 2007

In this homework you are required to verify certain aspects of the provided Java programs in two model checkers, JavaFAN and JavaPathFinder. Please address any questions to all of the following emails: {fengchen,grosu,tserban2}@uiuc.edu.

**Problem 1.** ThreadGame is a simple multithreaded program which shows the possible data races between two threads accessing a common variable. Each thread reads the value of the static variable `c` twice and writes the sum of the two values back to `c`. The question is what values can `c` possibly hold during the infinite execution of the program. Theoretically, it has been proved that all natural numbers can be achieved. Here we want to verify this conclusion for a specific natural number. More specifically, for a given natural number `N`, find a possible execution during which the value of `c` becomes `N` at some moment. Hint (for JavaFAN): the deadlock search function provided gives a good starting point and the property translation shows the way to extract the value of a static field from the `JavaState`.

**Problem 2.** The Pipeline program simulates the pipeline architecture of distributed systems. A desired property for this program is the propagation of termination: if the first stage stops, the final listener should stop eventually. Your task is to verify the correctness of this program w.r.t. the termination property. Hint: a special field, `stop`, is added to the program to indicate the stoppage of the stages.